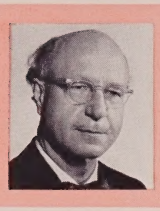
MOTOROLA NEWS GRAM

Volume 18, No. 3

in this issue . . .

Radio technicians at Panhandle Eastern Pipe Line Company check installation of MOTRAC radio with Extender operation, Motorola's new and exclusive built-in ignition noise suppression feature. See pages 3-5.



The Bud Has Formed— Watch For The Blossoms!

Two of the most interesting and most important developments in 1960 were the successful generation of coherent light and the practical application of epitaxial growth for the making of semiconductor devices.

I referred to the epitaxial growth process in my last commentary (Newsgram, Vol. 18 No. 2). This method of growing crystals permits the laying down of controlled layers of material in the formal crystal configuration. At comparatively low temperatures, the silicon or germanium molecules are precipitated from the silicon or germanium tetrachloride, so that as the molecule falls off the substrate, it attaches itself as a continuum of the growth of the single crystal structure of the substrate.

The use of the epitaxial growth in the fabrication of mesa transistors has produced the highest speed switching transistors ever made, with a substantial improvement in the breakdown voltage. As I mentioned previously, very greatly improved noise characteristics (2½ to 3½ db. total noise at 70 Mc.) is one of the bonuses contributed by epitaxial growth to transistor design.

Improvement of transistor design is not the only contribution which will be made by the epitaxial growth method. The formulation of integrated circuits in which the materials and structure (referred to as "morphological integrated circuits") are responsible for the function performed, depends upon our ability to control and alter the internal arrangement of donor molecules within the functional block. You can understand very readily that the problem of getting inside of a solid block of material is not readily solved. Alloying and diffusion have been used in the past and, of course, you recognize the alloying as a melting process, as for example, the melting of indium into a thin slab of germanium to form a junction. Diffusion is a slow process, where the penetration of the donor molecules is controlled by time and temperature. In the diffusion process, the donor molecules penetrate through the spaces between molecules of the germanium or silicon, and this is possible because, in solids, the volume of empty space is a million times greater than the total volume of the molecules.

The mesa transistor makes use of the diffusion process to control some internal characteristics of the tiny slab of germanium crystal which is used to construct the transistor. The diffusion process has produced very important contributions to the progress of transistor design, but the limitations of the process are certainly severe.

With the epitaxial growth method, it is no longer necessary to alter the internal distribution of donor molecules within a crystal slab after it has been formed; with the new method, donors may be introduced as each single crystal continuum layer is laid down. We can visualize the laying down of many successive layers, with donor molecules introduced to make either P or N-type material, with masking and connection techniques to permit access to each layer electrically, even though each layer is only a few millionths of an inch thick.

All this is my way of saying that, with the introduction of the epitaxial growth process, we have for the first time under our control, a method for controlling the internal characteristics of the circuit block as we built it up in successive layers. This opens up degrees of freedom for integrated circuit design which were totally unavailable before the advent of this new process. New devices and new integrated circuit configurations will result as this new process matures to a high degree of flexibility and control.

It is difficult to predict the range of the important applications which will result from the maturing of practical means for producing coherent light. Radio waves are produced as coherent, or in-phase, or single-wave-front, single frequency radiation, but light has been produced as a conglomeration of pulses of light energy without this single frequency, in-phase, single-wave-front characteristic. In the initial experiments, coherent light was produced by raising the energy state of electrons in a ruby crystal rod, so that when the electrons fell back to the normal state, light was emitted. This generator is referred to as a "laser," which is the code word for "light amplification by stimulated emissive radiation." The first production of this single-frequency coherent light was in the form of pulses. But more recently, Bell Laboratories has announced the successful generation of continuous coherent light with a new type of laser.

Now, about the applications. Coherent light makes it possible to produce an intense beam of light having fantastic directivity. With careful design, a source of less than a thousandth of a radian would deliver a beam 30 miles away which would be only 5 ft. in diameter. This means that practically all the energy could be collected again 30 miles from the source. With the development of suitable modulation means, wideband transmission would make possible the carrying of tremendous amounts of intelligence by a single beam. While it is true that fog and rain would seriously interfere with the beam, it is probable that as the art develops, effective means will be found for transmitting the light beam through pipes or waveguides, with mirrors to direct the beams around corners. Other applications for coherent light involve the use of a generator for automatic ranging and for radar systems.

Watch for the blossoming of laser and epitaxial growth applications. There will be new and interesting devices, circuits and systems. » » »

Sincerely,

Dan Noble

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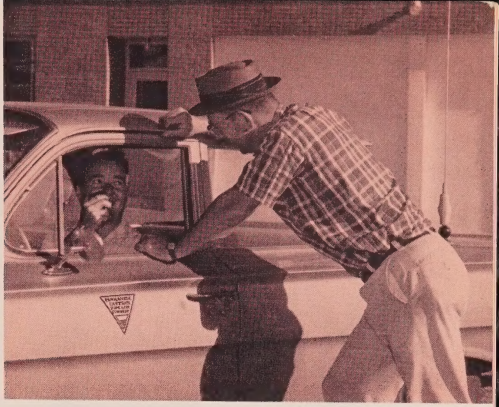
Communications Division

MOTOROLA NEWS GRAM

PIPELINE COMPANY REPORTS OUTSTANDING BENEFITS FROM EXTENDER OPERATION



L. E. Fetter (right) and D. T. Bennett, radio communications technicians for Panhandle Eastern, with one of the vehicles in which a MOTRAC radiophone with Extender operation was installed with some amazing results.

Initial results of the first MOTRAC radiophone installation with Extender operation prove that here is one of the truly outstanding achievements in 2-way radio during the last decade.

Two units undergoing extensive tests by the Panhandle Eastern Pipe Line Company in Kansas City, Missouri have already increased communications range by as much as 20 miles . . . increased "effective" receiver sensitivity by 8 times in high ignition noise areas . . . permitted mobile-to-mobile radio operation in areas where conventional radios formerly were ineffective.

Here are some of the benefits that became immediately evident as Technicians D. T. Bennett and L. E. Fetter of the pipe line company put the MOTRAC units through their paces out of the gathering and transmission network radio system based at Liberal, Kansas.

1) Usable communications were obtained at approximately 70 miles from the company's Knowles base station. Without the Extender operation, noise generated while the vehicle is traveling at highway speeds masks out readable communications at about 50 miles.

2) Preliminary tests in the high noise area of a pipeline compressor station utilize a T-connector to connect both the antenna and a signal generator into the receiver for making a standard 20 db quieting measurement. The heavy ignition noise caused by the large engines necessitated injection of 14 to 30 microvolts signal to overcome the noise and achieve 20 db quieting during several tests of standard receivers.

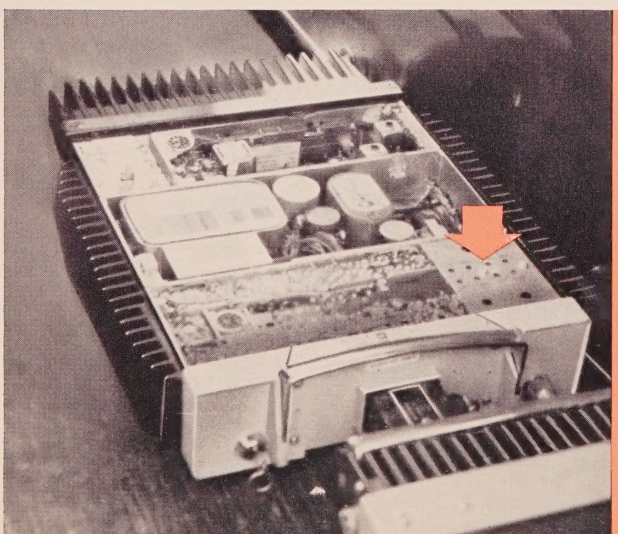
With the Extender circuit in operation in this highly critical impulse noise area, 20 db quieting was achieved with only 3.6 microvolts of signal.

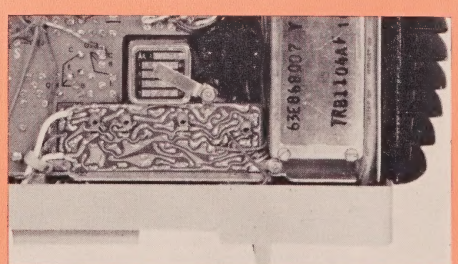
3) A third test was made near a portable generator for a welding machine such as is used in line cleaning activities. Although great amounts of impulse noises are generated by these machines, the Extender circuit was able to clean up these noises completely.

According to Bennett and Fetter, Extender operation in communications necessary for line cleaning activity will facilitate the five to 15-mile mobile-to-mobile coverage necessary. Without Extender operation, the use of several welding generators and many vehicles in cleaning lines creates severe ignition noise problems hampering reliable radio communications and often requires moving radio-equipped vehicles out of the area to higher ground.

Tests reported herein were made by Panhandle Eastern during the first few days of operation with the Extender-equipped MOTRAC units. While pointing out that the studies are in preliminary stages, J. A. Fowler, Panhandle Eastern's Superintendent of Communications in the Kansas City office says: "The tests indicate that the Extender model is the type of radio we want from now on." » » »

Below left, one of the MOTRAC radios with Extender operation installed by Panhandle Eastern. Arrow indicates the RF deck, start of the Extender operation. Below right, the Extender module which is located in the receiver at the bottom of the unit.

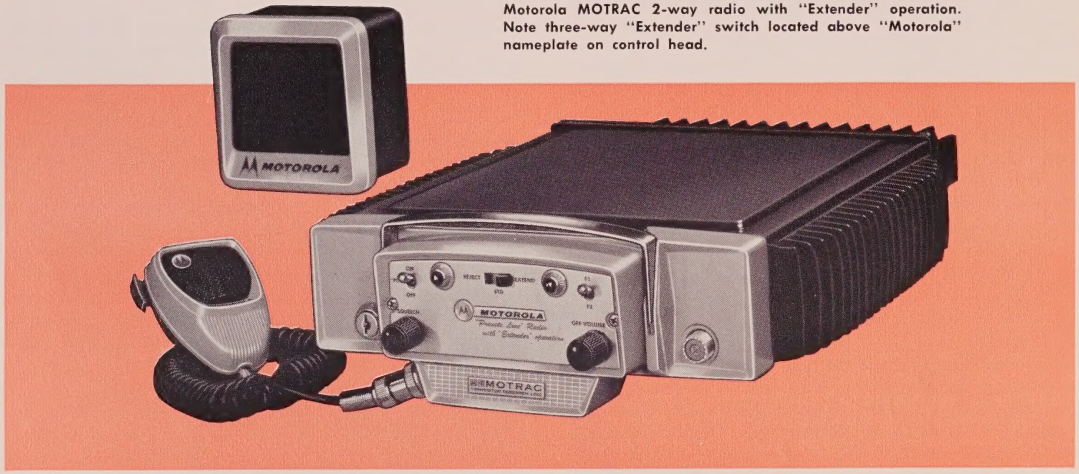




IGNITION NOISE IS GONE!

EXTENDER *operation*

Motorola Extender operation with ignition noise suppression built right into the unit greatly improves message reception . . . extends usable operating range . . . reduces interference from other radio systems.



Motorola MOTRAC 2-way radio with "Extender" operation. Note three-way "Extender" switch located above "Motorola" nameplate on control head.

Has ignition noise been robbing your 2-way radio communications system of 10% of its usable range? Have your mobile operators had to drive out to the fringe of your coverage area only to find that ignition noise and other pulse-type interference have drowned out their base station signal or the signal from other mobile operators in your radio system? Does ignition noise deteriorate the quality of your radio system in 50% of your coverage area?

Now, a truly effective solution to the ignition noise problem has been found. After eight years of research, design, and testing, Motorola has introduced, as an integral part of the MOTRAC radio, an electronic ignition noise suppressor. Known as Extender operation, the new optional feature blanks out ignition noise and other impulse interference from the user's own vehicle and other vehicles in the vicinity.

While automotive electrical systems have always generated ignition noise, the problem has grown in recent years through a combination of increased highway traffic, higher compression engines, and the shift to split radio channels. As channel widths are reduced and more organizations can realize the benefits of mobile radio, impulse interference becomes proportionately more severe.

There have been various partial solutions offered to help overcome the problem of ignition noise, but most of these have had one serious drawback: they were meant to reduce the ignition noise generated *within* the individual vehicle. They have no effect on outside interference. These ignition suppressors are often quite expensive, and, after they are installed, many reduce the engine efficiency or even harm the engine by reducing the voltage available at the spark plug.

By eliminating the degrading effects of noise, this new circuit provides clearer, more distinct communications throughout the radio system. New MOTRAC radio with Extender operation actually extends the quality and usable range of radio systems in those areas where ignition noise is stronger than the incoming radio signal.

When a spark plug fires, it produces a short burst of radio frequency energy. Since this RF energy contains components throughout the frequency spectrum, some interference will enter the receiver, regardless of the specific

frequency to which the radio is tuned. However, a plot of interference amplitude vs. frequency will show that the interference drops off as the frequency gets higher. Interference is highest in the 25-50 mc band. It is much less bothersome in the 150-174 mc and 450-470 mc bands.

Ignition noise pulses have an extremely short duration when they enter the receiver antenna. However, as these pulses pass through the receiver, they are progressively broadened by the tuned circuits. Therefore, noise suppression must be effected as close to the antenna as possible. What is more, the suppressor circuit must be fast-acting, so that the receiver is cut off only for a few microseconds during noise pulses, and then immediately opened to the incoming modulated signal. This all important high speed characteristic is part of the Motorola Extender circuit.

The noise pulses, along with the desired RF signal, enter the receiver through the antenna. The signal and the noise are delayed while the suppressing action begins. Simultaneously the interference travels through the Extender module. (See diagram)

Here noise pulses are detected, acted upon and used to bias a part of the receiver to cutoff at the precise time the noise pulses in the normal signal path attempt to enter this stage. The impulses are thus eliminated.

Its high speed enables the Extender circuit to effectively blank out tens of thousands of noise pulses per second with no noticeable effect on the radio message. For example, in an area of heavy traffic, such as on an expressway, the Extender circuit is able to eliminate the interference from scores of vehicles in the immediate vicinity, even when traffic is moving at 50 and 60 miles per hour.

Control of the Extender circuitry is achieved by a three position switch on the MOTRAC radio control head. When this switch is in the "STD" position, the receiver is the standard high quality MOTRAC radio receiver. With the switch in the "EXTEND" position, the impulse noise suppressor circuit is added to the receiver. Another feature of these new models is added to the MOTRAC radio receiver when the selector switch is thrown to the "REJECT" position. This feature provides additional protection against interfering signals from other radio systems.

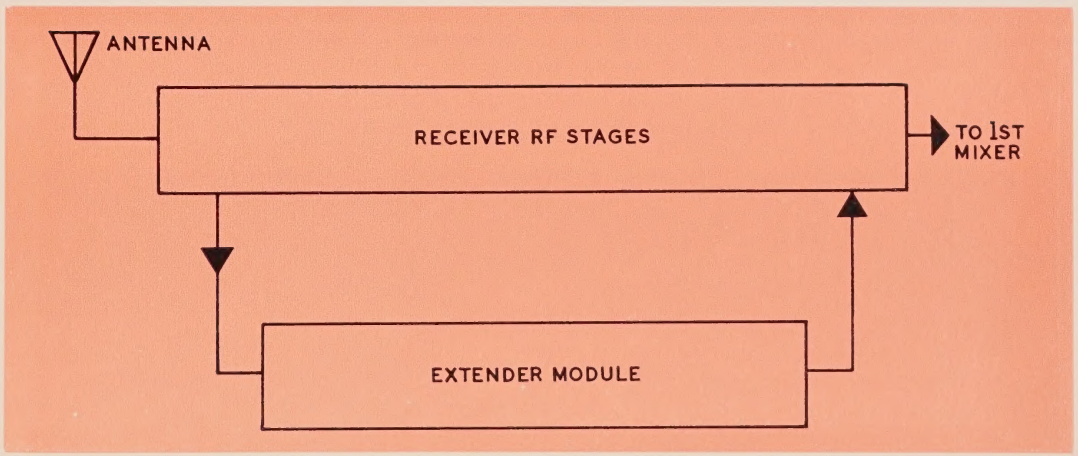
Both desensitization and intermodulation interference are caused by signals from transmitters tuned to frequencies other than that frequency on which the particular 2-way radio system is operating. A radio receiver may be desensitized by the presence of strong signals (commercial AM or FM broadcasts, 2-way radio communications, and television) from nearby transmitters. These signals sometimes force their way into a receiver, even though the receiver is operating on a different frequency.

Intermodulation, on the other hand, is the result of two alien radio signals beating together ("hetrodyning") in the non-linear elements of the radio receiver. The resultant signal, if it is near the frequency to which the receiver is tuned, will pass through the radio along with the desired signal and thus cause interference.

Mobile operators are generally well aware of the areas in which they can expect desensitization and intermodulation interference. This particular problem exists, for the most part, in areas heavily congested with radio signals. When this interference is encountered, the operator merely shifts the control switch to "REJECT", significantly adding to the intermodulation protection characteristic of the radio. » » »

HEAR FOR YOURSELF!

Extender operation is immediately available as a factory installed optional feature in all new low band (25-50 mc) MOTRAC radio equipment. It will soon be available in other frequency bands. You are invited to hear the difference Extender operation will make in your mobile radio reception. Write for a complimentary copy of the recording of radio reception, made under actual operating conditions, showing the dramatic improvement in communications quality through Extender operation — another example of Motorola's leadership in the field of 2-way radio communications.



RADIO BOOMS BUSINESS FOR BE-MAC

With a 2-way radio system, the Be-Mac dispatcher has the entire radio-equipped fleet at his finger tips and can dispatch, re-route, change orders, and give directions instantly—saving valuable time and eliminating costly backtracking.

Can a trucking company double its number of daily deliveries and raise its daily pickups by 100 while increasing its fleet by only one-sixth? It depends on 2-way mobile radio as a helper. Be-Mac Transport Company, Inc., at its Chicago terminal, has recorded such gains.

Chicago Terminal Manager Ken Glessner came up with the statistics when comparing 1955 and 1960 records. Glessner reports an average today of 115 more pickups a day than in 1955 and more than twice as many deliveries made. When the 1955 statistics were compiled, the company operated 28 non-radio-equipped trucks. It now has 34 radio-equipped vehicles, including one service truck.

In addition, the company has installed mobile radios in 24 trucks to cover metropolitan St. Louis, where similar productivity gains have been recorded. How does radio make possible such gains? Mainly due to the speed of contact between drivers and the dispatcher.

At Chicago, Be-Mac has 25 basic routes. To start the day, each driver is given one or two assignments. When these are completed, the driver radios the office for additional orders. With each man being radioed from job to job geographically within a small area, drivers can handle more calls in a single day.

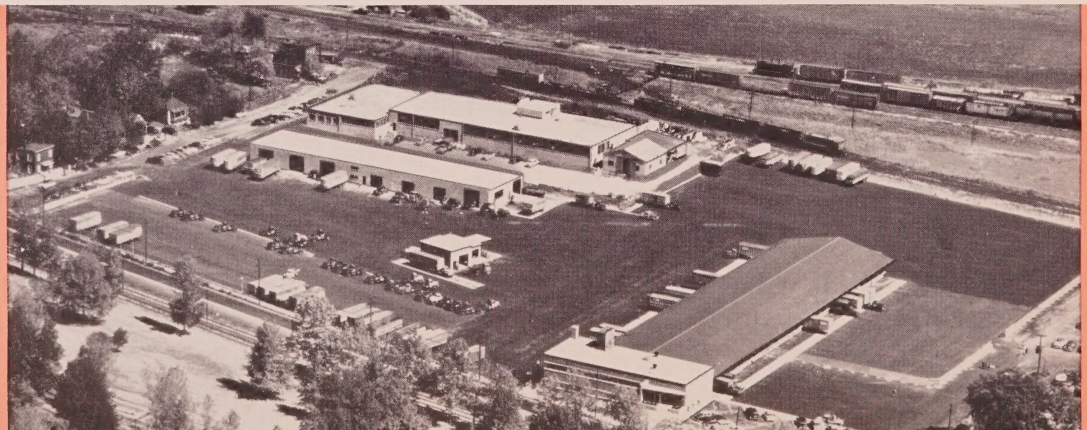
When drivers become tied up in heavy traffic, they can radio in for alternate assignments, at the same time alerting the dispatcher to the condition of traffic. Many times, several pickups are made in the time that would have been lost in the tie-up. Other trucks can be delivered away from the tie-ups.

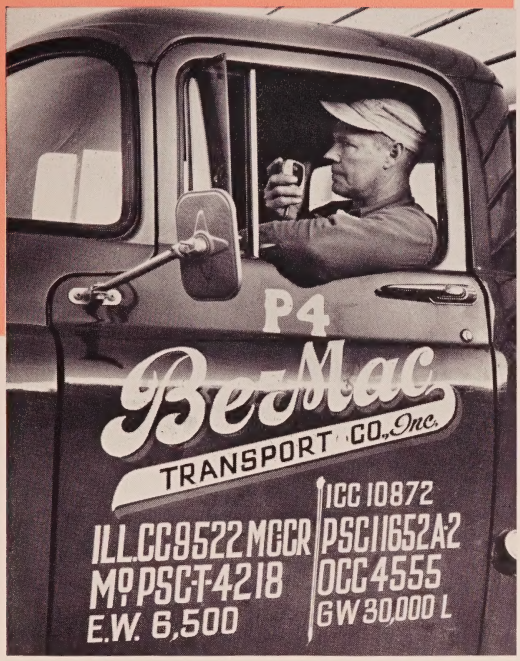
Many of the truck loads are destined for over-the-road shipment. Delays of local trucks will prevent the over-the-road vehicles from getting out on time. Radio enables better coordination of over-the-road operations. Each time a driver completes a pickup which is to leave Chicago, he radios in its total weight. With all drivers doing this, the dispatcher can determine how many trucks will be needed to carry goods to other cities.

After each pickup, drivers radio in the amount of space remaining in the truck so dispatchers know which jobs the men can handle. Much time would be lost if a truck was sent on a job that couldn't be completed due to lack of space. Radio has just about eliminated the missed pickup or delivery at the end of the day.

These uses of radio give Be-Mac considerable improvement of customer relationships. When a company can process an order quickly, naturally, the customer is going to be pleased. The flexibility given a trucking company by

Aerial view of Be-Mac headquarters in Chicago.





With his Motorola 2-way mobile radio, the Be-Mac truck driver has immediate contact with the dispatcher and can thus make the best possible use of both his time and that of the vehicle.

radio is definitely an advantage to the customer, and hence, a selling point for the trucker. A customer phones in with a rush pickup. The dispatcher checks his log book to see which truck is closer to the customer. This truck is radio dispatched to make the pickup. Everyone profits.

Fuel expenses are reduced through radio dispatching — another saving. This is realized through a reduction in backtracking. Before radio, a truck might make a call at, say, 25th and Central, then travel all the way to 55th and Central for his second job, only to be sent right back to 25th Street for his third pickup. Repeat this single use of radio over and over again for each of the 34 trucks and quite a fuel saving results.

The Motorola base station is located in downtown Chicago and is remotely controlled from the Be-Mac terminal. The antenna is mounted on a tall Chicago Loop building. Glessner estimates that normal range of this radio system is 50 miles.

At the St. Louis terminal, 24 Motorola mobile radios have been installed in Be-Mac trucks. The base station is again remotely controlled from the St. Louis terminal. The base station and antenna are located at the Park Plaza Hotel in St. Louis.

All 58 mobile units are Motorola MOTRAC radios, reports Peter W. Goode, Executive Vice President of the company. Through the extensive use of transistors, MOTRAC radios offer users added benefits which lower vehicle operating costs. These advantages are high reliability and low power consumption characteristics. High reliability is reflected in less maintenance.

Be-Mac has an agreement with Motorola for all maintenance of its radio equipment at both terminals. Motorola-authorized stations in St. Louis and Chicago perform periodic preventive checks and conduct all required servicing under subcontract.

The MOTRAC radio draws a minute amount of power from the battery—less than one amp on standby—another vehicle operation saving. The effect of this saving is drivers can monitor radios without running the engine. With conventional radios, it was necessary to leave the engine on for monitoring. Otherwise the battery would die.

Two savings result—less fuel is consumed and engine wear and tear is reduced, eliminating the need for frequent overhauls.

Glessner also reports "dead" batteries are rarities since the new radios were installed. Trucks can now be operated on standard generators, which aren't as expensive to purchase as heavy-duty types and cost less to repair.

The Be-Mac installation includes Motorola "Private-Line" radios, which are designed to reduce interference from other organizations operating on the same frequency. This feature is especially appreciated by the dispatchers.

Two-way radio in its pickup and delivery operations has enabled Be-Mac to double its number of daily deliveries—raise its daily pick-ups by 100—while increasing truck fleet by only one-sixth.

KANSAS CITY

Primary control center for the two-way radio network is located at the Kansas University Medical Center, Kansas City, Kansas.

Miss Susan Jenkins, executive director of the Association, studies disaster communications program.

Metropolitan Kansas City has taken steps to make sure history never gets the opportunity to repeat itself.

In 1951, and again in 1957, tragedy struck this populous area and both times the people were not ready.

It was Friday the 13th in 1951. In Kansas City, it is called "Black Friday". On that fateful July day, the Kansas River roared over its banks carrying with it catastrophe.

Nearly six full years later, the southeastern suburban area was hit by a raging tornado which took its toll in injury and property damage.

On each occasion, organization efforts pointed up the fact that a centralized hospital disaster system was needed.

In 1960, thanks to the Kansas City Area Hospital Association, it became a reality.

Development of a comprehensive hospital disaster network required thorough planning, reports Miss Susan Jenkins, executive director of the Association. Woven into this complex are two states, five counties and some 74 incorporated municipalities in addition to the four major ones—Kansas City, North Kansas City and Independence, Mo., and Kansas City, Kansas. Each has its law enforcement agencies and Civil Defense groups. Each operates independently.

The answer was a single organization that ignores all boundaries. In an emergency, the Kansas City Area Hospital Association disaster program crosses state, county, and city lines to integrate physicians, hospitals and the Red Cross for the one major effort. The Association has 43 member hospitals within a roughly drawn circle of a 50 mile radius. Its members represent all the larger hospitals as well as the majority of the smaller ones.

The centralized disaster program was put into action for the first time when a gasoline and oil fire broke out in a tank storage area on one of the main streets in Kansas City, Mo.

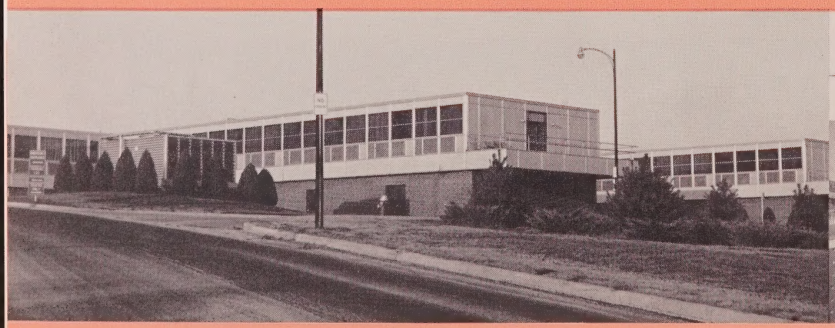
Reported the Kansas City Star, after the fire:

"The disaster plan of the Kansas City area hospitals was put into effect for the first time during today's fire emergency and was credited with life-saving results."

The article went on to quote the city health director, who said, "Had the plan not been in effect today some hospitals would have had far more victims than they could have handled and the results could have been even more tragic".

Heart of the disaster program is a two-way radio network. The system, installed by Motorola of Chicago, provides instantaneous contact between hospitals as well as from hospitals to key persons in cars. With the system, any hospital can contact any other hospital, group of hospitals or all hospitals simultaneously. Persons in mobile units can communicate with their assigned hospital or any other hospital on the same frequency, if necessary. Any one hospital can contact any mobile unit as well.

The Kansas University Medical Center in Kansas City,



One of the 12 hospitals presently participating in the radio network is the modern North Kansas City Memorial Hospital, North Kansas City, Missouri.

North Kansas City Memorial Hospital Administrator James R. Rich replies to radio call from primary control station.

HOSPITAL ASSOCIATION INSTALLS RADIO TO COORDINATE DISASTER PROGRAM

Kansas, has been designated as the primary control point. Kansas City General Hospital in Kansas City, Missouri, is the secondary control point.

Mobile radios have been installed in the cars of Miss Jenkins and Dr. Grosvenor G. Roberts, director of the disaster operations staff. Special tone generating equipment permits them to talk directly with either the primary or secondary control points from their cars. Communications with other hospitals is possible by "going through" either the primary or secondary control stations.

Both the Kansas City Police Department and Red Cross participate in the system through monitor-receiver hookups. In turn, by installing monitor-receivers on the Red Cross and police frequencies, the Hospital Association is able to "cross receive" with each of these groups.

In an emergency, the radio network would be the key factor in coordinating the movement of casualties to hospitals and providing hospitals with needed supplies, reports Miss Jenkins.

Following the alert, which could come from any person to any location, the primary control station would be put into action.

One of the most vital uses of the network will involve moving casualties to the closest hospital equipped to handle them. At the disaster scene, the ambulance driver would be told which hospital is to receive the injured. The designated hospital would be contacted by radio so it could prepare for the arrival of the patients. State, county, and city boundaries would be ignored.

Controlling the movement of the injured by radio would eliminate bottlenecks at hospitals. By keeping a record of the number of injured being sent to each hospital, the staff at the primary control station could make sure that no hospitals were being overloaded while others were being bypassed.

Equipment, vitally needed at one hospital, could be secured by placing a radio call to all other hospitals on the network.

Radio would coordinate the delivery of life saving supplies, said Miss Jenkins. Each hospital stocks a certain amount of emergency supplies, but during a disaster, it is probable the stock would be insufficient. When an emergency occurs pharmaceutical houses automatically drop off supplies at the various hospitals. This is not the most efficient system, however. It may be that a certain hospital doesn't need the item left at its door, but has dire need for some other supply.

With the radio network, control of supply can be accomplished from the primary dispatch point where a telephone listing of all supply houses is maintained. The control point would secure lists of material needed by each hospital, then place orders with the suppliers, designating which hospital was to receive each item.

Identification of the injured can be simplified through coordination by radio. The names of all casualties would be radioed to the control point and given out to the newspapers, radio and television stations from there. This method eliminates the need to have each newspaper contact each hospital for the names and hence frees the hospital staffs to devote more time to caring for the injured.

During disasters, it is natural for people to try to find out what has happened to members of their families. Should a parent come to a hospital to check on a son or daughter, with radio, the central control station can be contacted to see which hospital has received the patient. If the person desires to know the present condition of the injured member of the family, the hospital caring for the person can be radioed.

The Kansas City Area Hospital Association's new radio network has everyday uses as well. Either Miss Jenkins or Dr. Roberts can be reached through the radios in their cars for emergencies or for routine business. Anticipated expansion of the system will enable administrators and key personnel equipped with radios to be in touch with their hospitals at all times. Four such administrators presently operate radios.

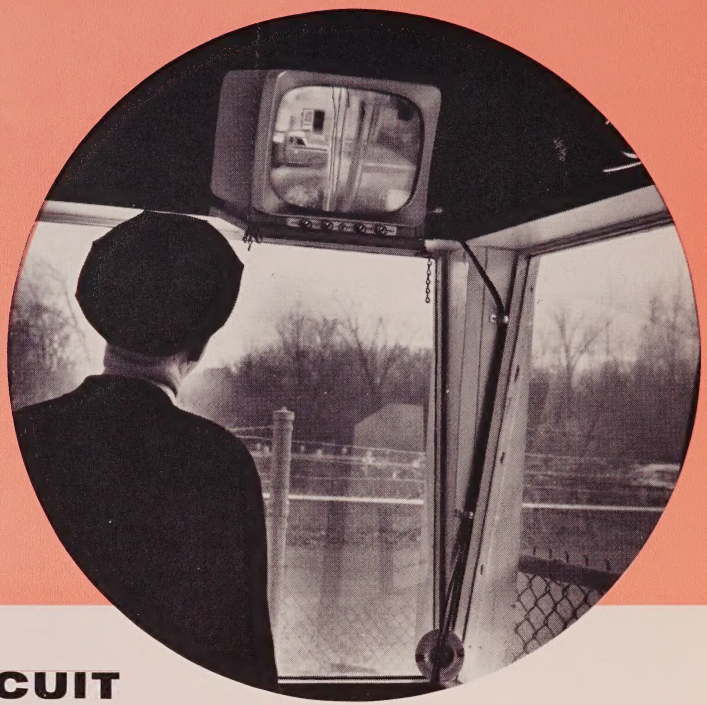
The new system permits mobile to mobile conversations, reports Miss Jenkins. Should an emergency suddenly occur while key officials are in their cars, the plans for coordinating movement of casualties can still be put in motion immediately.

The vehicles used to deliver blood from the bank may soon be radio-equipped to save valuable time. » » »

Dr. Grosvenor G. Roberts, Director of the Disaster Operations staff, uses radio in his car to contact K. U. Medical Center.

Radio call is initiated from primary control station by Russell H. Miller, Associate Director at K. U. Medical Center.

Richard A. Cranford, Administrative Assistant at K. U. Medical Center, operates system from emergency room.



Guard at central security office 1,000 feet away from truck gate. One guard controls both areas with help of closed-circuit television.

CLOSED-CIRCUIT TELEVISION PAYS FOR ITSELF

Growing pains priced at $15,000 a year were eliminated by a remote control gate installation at the main plant of Kordite Corporation, plastics manufacturing firm in Macedon, New York.

Remote controls open and close the gate . . . speaker-microphone units provide voice communications . . . a Motorola closed-circuit television system keeps an electronic eye on the operation. Control point is the central security office, 1,000 feet away. One man controls and guards both entrances.

Marvin Brownell, Manager-Industrial Engineering and Production, relates: "Kordite's growing pains came with the opening of a new warehouse on December 1, 1960. Our shipping dock was extended across a plant road to join the warehouse. Vehicles going to and from our receiving department at a back corner of the company's property could no longer use the front gate or the plant road.

"A 12-foot wide gate was installed near the 6-truck receiving dock. Trucks bringing in resin, cartons, ink and other supplies now come in from a Macedon street instead of using Kordite's front gate and driving through company property. Congestion at the front gate was relieved and a better traffic situation exists within the plant property."

To man the new gate, however, the company was faced with adding three men to its guard force. Instead, television and automatic control combined to do the job—hence, the $15,000 annual saving. The cost of the entire system was less than half this amount. Consequently, six months of operation paid for the equipment.

Motorola CCTV camera is mounted inside a weatherproof housing 18 feet above the truck gate area. Camera's focus, brightness and iris opening are adjusted from controls in central security office.

Truck drivers can remain in their cabs while talking to Kordite guard through speaker-micophone units mounted on each side of the 12-foot wide sliding gate.

F IN SIX MONTHS

A Motorola television camera is in a weatherproof housing mounted atop an 18-foot pole, overlooking the gate and its approaches. Automatic focus, brightness adjustment and iris opening is applied to the industrial TV camera from a control unit in the front security office.

Cable connects the camera to a 14-inch monitor mounted high in the front security office. Normal home-style picture controls are available at the monitor.

Brownell continues: "Originally, we expected that it would be necessary to handle identification at the gate through the intercom system. However, we found that the quality of the television picture enabled us to make visual identifications. To further improve the image, two groups of neon lights were mounted above the gate area. The round-the-clock illumination increases the light at the scene by 15 foot-candles.

"The gate operating mechanism is an electrical device which opens, closes or stops the motion of the sliding gate by the touch of a button in the security office. Voice communications work through speaker-microphone units mounted on each side of the gate at truck cab height and an office intercom unit. Drivers using the gate remain behind the wheel while giving company name and exchanging other information with the controlling guard at the front of the plant.

"The observation and control system is at work 24 hours a day, 7 days a week. It was supplied and installed by Motorola in late 1960. » » »

Neon lights illuminate truck gate area on a 24-hour a day basis to further improve image on TV monitor in security office.

PAVING COMPANY "TUNES IN" BIG BENEFITS

One of the Kelly trucks delivers a load of asphalt to a crew engaged in paving the "apron" of a superhighway.

Close coordination is extremely important to the contractor who wants to add volume and increase profits while keeping costs to a minimum. As a firm grows and projects become scattered over an expanding area, the problem of retaining efficiency and control increases accordingly.

This was the situation facing the Kelly Paving Company, Inc. of Lithonia, Georgia. Various crews and individuals engaging in a wide variety of activities—sales, grading, installing curbs, putting in driveways or other paving surfaces and delivering asphalt—were scattered in and around neighboring Atlanta. Construction supervision, alone, required extensive driving from one site to another to provide the necessary divisions and advice.

And then there were the sales calls that had to be made, the estimates that had to be prepared, the bids that had to be submitted — not to mention the inspection and callbacks that are so important in keeping cordial customer relations. There just weren't enough hours in the day.

Because of these factors, the company installed a Motorola 2-way radio system with some immediate results. Company officials and supervisors suddenly found it was possible to be in several places at once. Two-way radio immediately increased operating efficiency by upwards of 25 percent.

Here are some of the facts concerning the company and how 2-way radio has provided outstanding benefits throughout the firm's operation.

The company is operated by four brothers, Jim, Bill, Drew and Buck Kelly. This group also owns and operates Kelly Granite Company, Inc. which supplies stone and fill and granite blocks for curbs. The brothers also operate the Kelly-Blount Asphalt Plant in connection with another contractor.

Typical Kelly Paving contracts include driveways and parking lots, streets and curbs, aprons for superhighways as well as street construction from rough grading through completion.

In these far-flung activities the company often has as many as 10 large projects going at once. The driveway

Equipment at the Kelly Company office consists of this Motorola base station, desk mike and a handset in another office.

crew may work on several jobs a day. In coordinating these many activities, 2-way radio has provided some outstanding benefits. For example, Jim and Bill Kelly, who are charged not only with supervising construction but also with activities connected with sales, formerly traveled as much as 500 miles a day in going from one site to another. In addition to being costly in gas usage and vehicle wear, this left them little time for the customer contact so necessary to continued or expanded volume of business.

With the installation of mobile units in their cars, however, and additional 2-way radio sets in the pick-up trucks used by Drew Kelly and several of the foremen, plus a base station at the office and a mobile unit in the curb-

hauling truck there have been considerable changes for the better. For example, either of two sub-grading crews may be operating in a remote location preparing a street in a new sub-division for paving. This involves expensive machinery which must be kept as productive as possible. With a radio-equipped vehicle stationed at the site, any questions involving the work, breakdowns or other emergencies can be handled quickly with a minimum loss of time. In these areas, radio is often the only means of communication, and telephones are far and few between.

If a breakdown or other work stoppage should occur, a mechanic or a necessary part can be dispatched immediately. This helps to keep the operation on schedule, since sub-grading is followed quickly by hauling of fill and sending in one or two grading crews that prepare surfaces for asphalt. While this work is going on one or more crews can be engaged in setting in the granite blocks that are used for the curbs. Use of radio in the curb hauling truck is particularly helpful in these cases, since it can be radio dispatched from one site to another and can even be re-routed to another location while "on the road".

"In all of this work," Jim Kelly points out, "close supervision is a must. For the most part, the work involves low-cost labor who cannot be expected to make the more important decisions. Even the foreman cannot be expected to assume a responsibility for some of the major problems that are encountered. That's where Bill and I come in.

"With radio in our cars," he continues, "we can be reached whether we are driving from one point to another or if we are parked at a different construction site. We can either go to the spot or suggest a solution, whether it involves re-assignment of the crew, repairing a machine or even dispatching additional men and equipment.

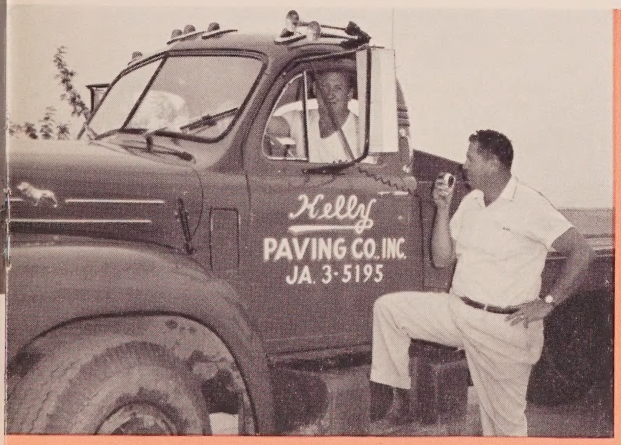
"Most of the time a radioed discussion will solve the problem and relieve us of the trip. This means that Bill and I can spend a great deal more time on the road conducting inspections or engaging in various facets of our sales work. There is no doubt that radio has given us many more man hours per week."

In the asphalt delivery end of the operations, 2-way radio likewise offers some outstanding advantages. If each driver delivers his load of hot asphalt, he returns to the batch plant for a refill. Before embarking on his next delivery, he checks with the office.

Through radio contact with the field personnel, the office can determine whether he should go on to his previous destination or whether the asphalt is more urgently needed in another location. With several asphalt trucks constantly on the road, this means of dispatching assures a continuing source of deliveries for each job.

In the asphalt business, delivery of material in its optimum state is of extreme importance. Should a driver arrive at a job and find that he is unable to make his delivery, he can inform the foreman who will contact the office to determine the next best disposition of the load.

The Kelly Paving radio system operates on the Business Radio Service frequency and utilizes a Motorola "Compa-Station" base station at the office, four MOTRAC radio units with completely transistorized receivers and power supplies; four "T-power" units with transistorized power supplies for both transmitter and receiver and two "Twin-V" units and an antenna located atop the tower at the asphalt plant site which provides more than sufficient range for a 10 to 12-mile radius from the base station in which the firm operates. » » »



Two-way radio in this truck used for hauling curbstones has aided greatly in getting maximum efficiency from he vehicle.

While inspecting the site where a sub-grading crew is operating, Jim Kelly receives a radio message from the office.

"VOICE PAGING" REACHES KEY PERSONNEL IN A HURRY

Switchboard operator selects buttons on paging console to transmit alerting tone to one of the company's radio paging units. Voice message will follow, giving the person called complete instructions or information; all other pagers will remain silent.

Selective radio paging has solved at least two pressing problems for the Wallerstein Company, a Division of Baxter Laboratories, Inc.

First, the system has eliminated many of the headaches associated with contacting key personnel "on-the-move" for the Staten Island, N. Y. producer of industrial enzymes. Radio paging now selectively contacts the person sought—in the plant or several miles away—and gives him a positive "voice message". Second, the paging system has virtually eliminated use of the plant's whistle to signal key employees. This has helped greatly from a public relations standpoint, as residents in the vicinity no longer complain about whistle blasts.

In addition, wage savings made possible are expected to pay for the system within two years. When more intangible savings in efficiency improvement are calculated, the pay-out time shrinks to less than 12 months, according to company officials.

The Wallerstein radio paging network features Motorola Very High Frequency equipment, installed in December of 1960. The system not only covers the firm's four-block-square plant from cellars to rooftops, but also reaches out several miles.

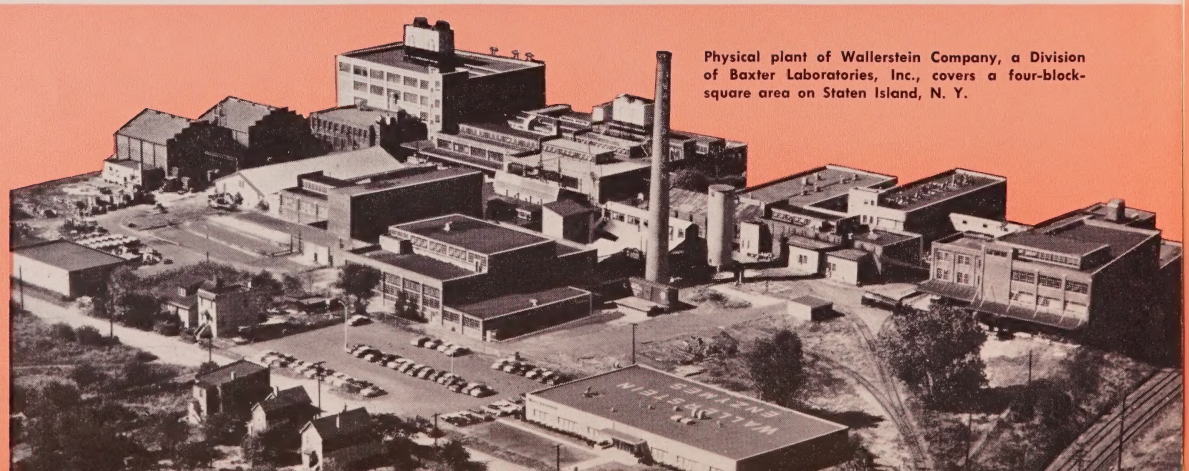
Here's how Walter L. Van Nostrand, Vice President-Production, reviews his former paging problems and the advantages of the new system: "Our use of the plant steam whistle involved various combinations to notify engineers, production superintendents and maintenance supervisors that the switchboard operator had a message. Better than 100 calls a day were made, the system was time-consuming and paging was often ineffective because people called were in spots where they could not hear the whistle.

"In a comprehensive study of solutions," Van Nostrand points out, "we determined that 10 persons received the most calls. When we installed the radio paging system, these personnel received pocket pagers, which weigh 10½ ounces and can be carried in a pocket or clipped to a belt. In operation, requests for paging are received at our telephone switchboard room, which serves as control center for the radio system.

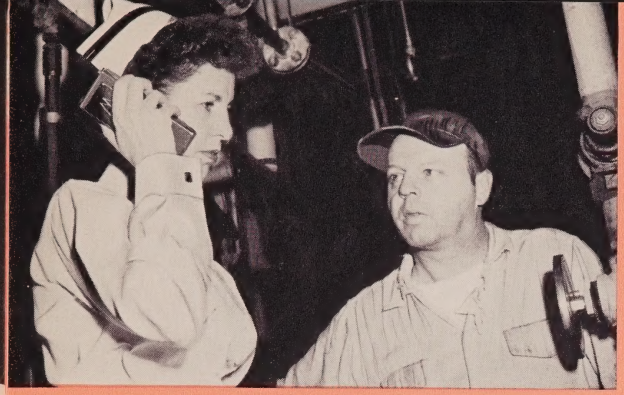
"One of two operators on duty handles the paging console, which can accommodate a total of 90 pagers. An 18-20-watt base station on top of the switchboard and a small antenna atop the building roof 26 feet from the ground complete the FCC-licensed system."

Van Nostrand continues: "To make contact, the operator presses the appropriate buttons corresponding to the number of the pocket receiver worn by the person being sought. The pagee is alerted by a tone signal, he depresses a button on his personal unit, and a voice message follows. Only the person being paged is alerted."

This "positive" alerting is extremely important in many Wallerstein plant operations. Enzymes are living substances which trigger chemical reactions during the production of



Physical plant of Wallerstein Company, a Division of Baxter Laboratories, Inc., covers a four-block-square area on Staten Island, N. Y.



Plant nurse, talking with a Wallerstein production employee, receives a call on her paging unit. Radio keeps her "in the dispensary" to handle an emergency case regardless of her location in or near the plant as she goes about her duties.

Morris Umansky, supervisor of project engineers, confers with a production supervisor on the plant grounds. Both men can receive important messages at any time through the compact radio paging units they carry.

various foods, textiles, cleaning agents and pharmaceutical products. Their production is a delicate combination of isolation, fermentation, purification and other closely-controlled processes.

Quality consciousness, plus operating economy, demand immediate attention to enzyme "crops" at various stages of growing processes. Highly-trained personnel must be on hand at the right time to apply corrective measures if required to prevent adverse reactions from setting in and perhaps reducing the yield of a crop or lowering its economic value. Radio paging provides the needed "dispatching" of required personnel.

Six of the radio pagers are used by personnel directly involved in production, with one carried by the production superintendent and five utilized by the project engineering staff. Work involving these people is widespread, yet interconnected, and requires a great deal of liaison. Radio paging ties it together, saving time and increasing the staff's working efficiency.

Since breakdowns in equipment require not only immediate attention to most effectively utilize the enzyme crops, but also fast action to eliminate wasted labor costs as the result of inoperative facilities, the maintenance supervisor carries a pocket pager in his plant travels. In this way, he can be instantly alerted to equipment malfunctions and can take immediate corrective measures.

The maintenance supervisor also serves as chief of the company's fire brigade and is charged with direction of the plant fire fighting force. With radio, he can be directed to the scene of any fire as soon as the report comes in. Early attention could save property and lives.

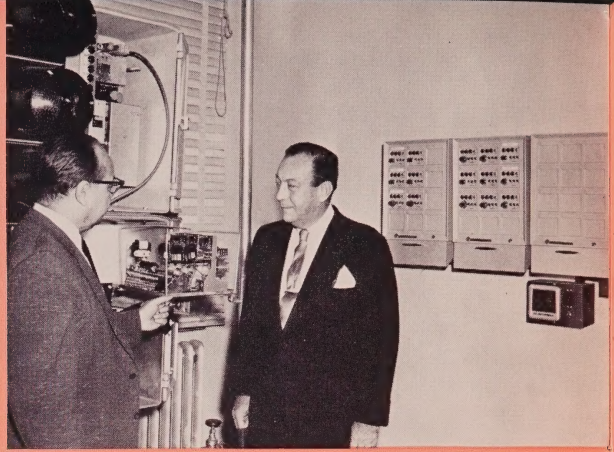
Another radio pager is assigned to the plant nurse. She is responsible for sanitary housekeeping and hygiene in the plant and is often out of her dispensary while making inspections. With her pager, she is instantly available in emergencies.

The other radio pagers are used by the yard superintendent and his assistant who supervise the loading and unloading of trucks and railroad cars. Calls to them on the plant whistle were frequent. With the quiet, personal radios, they can be located quickly—in warehouses, on shipping docks, between buildings, wherever they might be—to handle orders or shipping problems. » » »

Maintenance supervisor, wearing a Motorola VHF Pocket Receiver and lapel speaker, checks a fermenter during a regular inspection tour. Radio paging keeps him instantly available for any maintenance problems that come up.

Pagers use rechargeable nickel cadmium batteries, are stored each night in a Motorola battery charger.

NEW YORK CITY PIONEERS PUNCHED-CARD RADIO TRAFFIC CONTROL



Traffic Commissioner T. T. Wiley (left) points out internal mechanism of standard traffic signal controller to Mayor Robert F. Wagner. Equipment at right includes Control and Display Panels indicating program in effect.

Installation of a Motorola Radio Traffic Control System in New York City has had some far-reaching results. The punched-card system, pioneered in this installation, is designed to provide centralized signal control—while making possible outstanding savings in modernizing existing traffic control systems.

The radio control system will permit broader application of progressive signal timing and enable signals to be changed from a central location without sending personnel to the site. It will also permit expedited rush-hour traffic by favoring inbound vehicles in the morning and outgoing traffic in the evening. Radio control will also make parallel routes available in the event of traffic tieups.

Under the new system, as many as 18 different types of programs or schedules can be put into effect at each intersection—each within an interval of not more than 12 seconds—by means of a punched-card reading device.

Cards are fed into equipment which translates the pattern of perforations into coded electronic impulses that are routed by telephone cable to an unattended FM radio transmitter. Impulses are broadcast as ultra high frequency signals. At a street intersection, the receiver-decoder on the signal pole controls the traffic light according to the instructions received for the particular location.

Each card in a "program" controls one or more traffic signals. Punching on the cards represents both the location of the signal and the pre-determined instructions for the functioning of the light.

Under the old system, changes in signal timing at the vast majority of the city's signalized intersections are being made by individual adjustments at each control box. This makes programmed or emergency changes impractical.

Signal interconnections to permit timing schedule adjustments and synchronization of staggered light systems are made by laying cable between each signal. This is an expensive method and not only causes disruption of traffic during construction but also costs approximately $50,000 a mile, according to a traffic bureau spokesman.

Motor undergoing inspection is used to drive the master dials used for synchronizing the entire system.

Installation of the radio system reduces this figure to only $15,000 a mile and eliminates both the cost of street excavations and traffic delays resulting from such construction.

The initial New York system, built at a cost of approximately $125,000, includes a transmitter station at Queens General Hospital that receives messages from the Master Controller located at the Traffic Department Headquarters. The system is capable of ultimately controlling all of New York City's 9000 signalized intersections. » » »

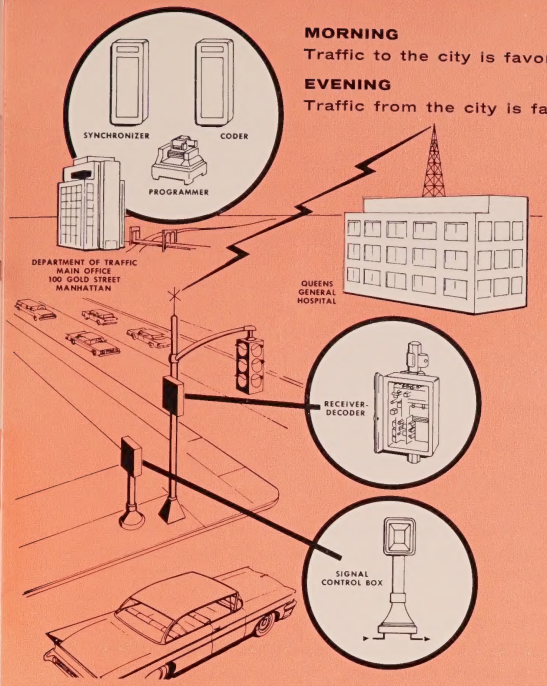
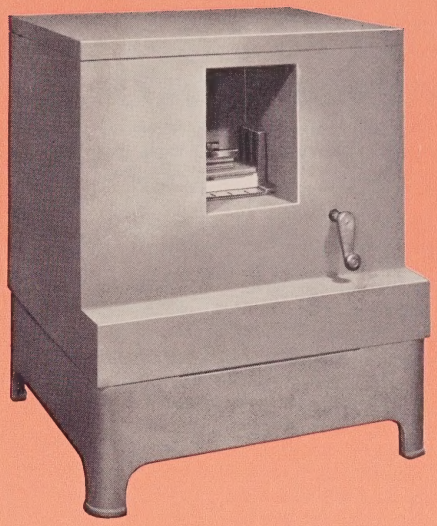
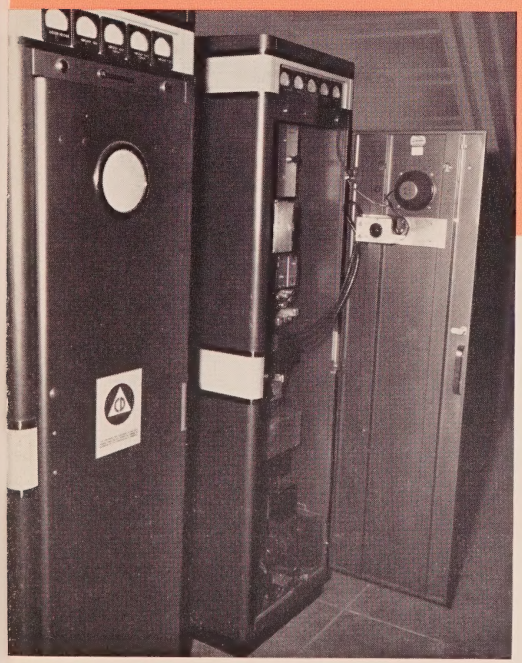


Diagram indicating how radio traffic control program is applied to a particular street.

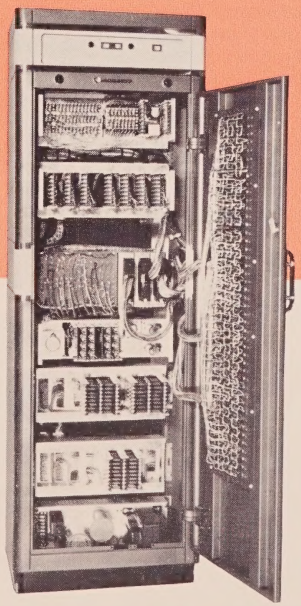


Punched Card Reader which analyzes programs contained on perforated cards.

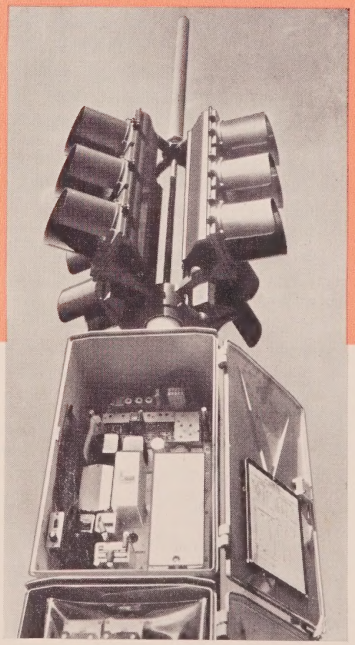
Dual transmitters located at Queens Hospital in Manhattan are designed for automatic switchover to provide the utmost in reliable operation.



Programmer Cabinet used in conjunction with the card reader. Contains electronic circuits used to select programs for specific intersections.



This typical control box at one of New York City's intersections is part of the radio-controlled system.



SERVICE HINTS AND SHOP NOTES

New Transistors for "Handie-Talkie" Power Supplies

The older type XN-12 transistors used in the NU137 and NU138 power supply, the following voltage measurements series "Handie-Talkie" Radiophones have now been replaced by the newer type MN-22 (Motorola part #48A125266) or type MN-23 (Motorola part #48A125-267) transistors. This change has been incorporated in all current production models of the "Handie-Talkie" power supplies. However, if you should encounter a defective XN-12 type transistor in a NU137 or NU138 power supply, it is recommended that the newer type transistor be substituted.

The MN-22 or the MN-23 transistor is a direct replacement for the XN-12 IN THE NU137 POWER SUPPLY ONLY. An MN-23 *must* be used as a replacement in the NU-138 power supply. When an MN-23 is installed in the NU138 power supply, the following voltage measurements and circuit adjustments should be made.

(1) Before proceeding, make sure that the transmitter itself meets the power output requirements. Replace the antenna with a dummy load.

(2) Remove the power supply chassis from the battery case. Connect the power supply to the radio case by means of the "blue ribbon" power connector (J-104).

(3) Do not apply power to the unit until you have checked the voltage plug (P-101) for proper *12 volt* termination, as shown in the instruction manual. Once this has been checked, connect the unit to a WELL REGULATED 12 volt supply which will maintain a constant 12 volt level during the testing procedure. If you use a pair of nickel-cadmium battery kits for the 12 volt supply, make sure that they are fully charged. Measure the primary input voltage at the transistor deck to make sure that the transistors are receiving the proper operating voltage.

(4) Key the transmitter and measure the voltages on the pins of the "blue ribbon" connector (J-104) as shown in the accompanying chart. If these voltages are not within the limits shown on the chart, adjust the power supply feedback resistor (R-107). This adjustment is done best by setting R-107 to its maximum value and then "backing down" the tap until the correct voltage can be measured on the pins of J-104.

(5) Now repeat the proceeding steps for 6 volt operation. First, reconnect the voltage plug (P-101) for *6 volt* operation as shown in the instruction book. With a WELL REGULATED 6 volts DC applied to the unit, again check the voltage at the transistor deck to make sure that the transistors are receiving the proper operating voltage.

PIN	VOLTAGE TOLERANCE
5 (High B+)	+230 to +250
12 (Low B+)	+115 to +135
14 (Filaments)	+1.2 to +1.45
11	−5.5 to −6.5

Voltage Tolerances on Pins of J-104 in NU138 "Handie-Talkie" Power Supply.

(6) Key the transmitter again and check the same pins on the "blue ribbon" connector (J-104) for the proper load voltages as shown in the accompanying chart. If these voltages are still within the proper limits, the work is completed.

(7) However, if the voltages on J-104 are NOT within the prescribed tolerances, remove R-104 (0.56 ohms) from the power supply and replace it with a 1.8 ohm, wire wound, 1 watt resistor (Motorola part #17K890469). Once this modification has been made, the MN-23 transistor will work properly in the NU138 power supply.

Remember, enter these changes in the instruction book so that the schematic will agree with the actual circuit. » » »

Model TLN6287B Footswitch

New Footswitch Aids Busy Operators

Here is a handy accessory for the base station operator who has to use his hands to look through papers or write while transmitting — the new Motorola TLN6287B Footswitch. The unit consists of two treadle type switches mounted side-by-side in a heavy cast iron housing. One pedal keys the transmitter while the other pedal disables the "Private-Line" function so that the operator can monitor the channel before transmitting. The footswitch includes an 8-foot, 5 conductor shielded cable which is connected in parallel with the hand operated push-to-talk and "Private-Line" on-off switches. » » »

Improving Intelligibility in Remotely Controlled Systems

Most offices and other areas used for base station dispatch or control points are fairly "live", acoustically. If the microphone input level control is set too high on TA270 and T1200 series Remote Control Consoles, the microphone will pick up and even exaggerate background noises and room reverberations. These reverberations can be particularly annoying because they cause hollow or "muddy" voice reproduction at the receiver. A simple, but very effective means of improving the overall voice quality throughout your systems, is to reduce the microphone input level. Adjust the INPUT LEVEL control on the console until satisfactory voice quality is restored.

Always check your newly adjusted unit with a mobile radio in your system to assure satisfactory operation. » » »

Increasing Service Life of ¼ KW Base Station Antenna Relays

Here are a few simple wiring modifications which will substantially increase the service life of antenna relays in B63AAB and B64AAB series ¼ KW Base Stations shipped prior to May, 1959. These modifications will eliminate relay contact arcing by placing the antenna relay solenoid in parallel with the primary winding of the Exciter Plate Power Transformer. The antenna relay will now remain energized for a short period after plate voltage has been removed from the power amplifier, thus preventing relay arcing. Wiring modifications are as follows:

For B63AAB Series ¼ KW High Band Models

(1) On the High Voltage Power Supply locate the wire connected between lug 5 of the Overload Relay (K2) and lug 9 of the High Voltage Power Supply terminal board.

(2) Remove the end of this wire from lug 5 of the Overload Relay and re-connect it to lug 15 of the High Voltage Power Supply termial board.

(3) Connect a lead between lug 5 of the Overload Relay and lug C1 of the Plate Contactor Relay. (Also on the High Voltage Power Supply).

(4) Add a lead from lug 9 of the High Voltage Power Supply terminal board to lug 6 of the Exciter Power Supply terminal board.

To keep your instruction manual up to date, enter the changes made in steps 2 and 3 on the High Voltage Power Supply Schematic diagram. Enter the change made in step 4 on the Intercabling diagram.

For B64AAB Series ¼ KW 450 MC Models

(1) On the High Voltage Power Supply disconnect the lead from the coil of the Plate Contactor Relay (K4). (This lead runs from K4 to lug 11 of the High Voltage Power Supply terminal board).

(2) Re-connect the free end of this wire to unused lug L1 on the Plate Contactor Relay.

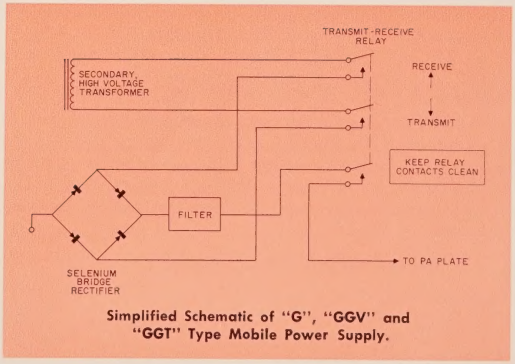
(3) Place a jumper between lugs T1 and T2 of the Plate Contactor Relay.

(4) Add a wire between lug 11 of the High Voltage Power Supply terminal board and lug 6 of the Exciter Power Supply terminal board.

To keep your instruction manual up to date, enter the changes made in steps 1, 2 and 3 on the High Voltage Power Supply Schematic diagram. Enter the change made in step 4 on the Intercabling diagram. » » »

Low B+ in "G", "GGV", and "GGT" Type Mobile Units

Here's something you might keep in mind when servicing mobile radiophones in the "G", "GGV", and "GGT" series. Under "transmit" conditions, a low B+ measurement on the plate of the power amplifier may lead you to believe that the selenium rectifiers are defective. Before "digging" into the bridge circuit itself, check to see if the "lost" voltage is being dropped across the contacts of the transmit-receive relay; these contacts may be worn, dirty or pitted, and in that case, they could be the cause of the trouble. As shown below in the simplified schematic of the power supply, the relay not only applies high voltage to the plates of the P. A., it also connects the ends of the high voltage transformer to the bridge circuit. » » »

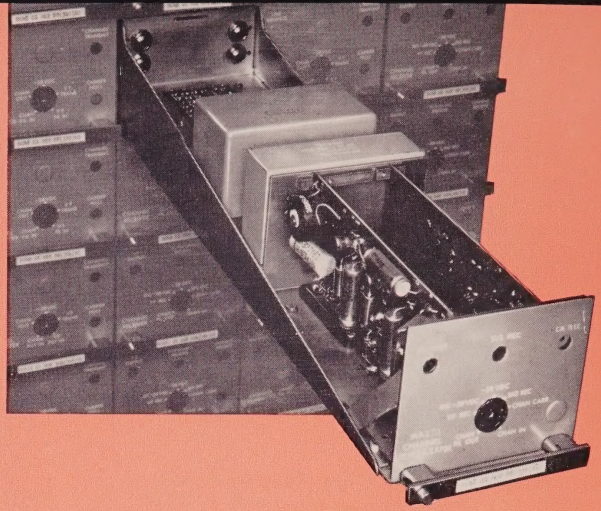


Simplified Schematic of "G", "GGV" and "GGT" Type Mobile Power Supply.

MOTOROLA'S "50" SERIES...

Outstanding Answer to the Challenge of Modern Multi-Channel Microwave Communications

- **Greatly Increased Reliability**
- **More Economical Operation**
- **Simplified Installation**
- **Lower Power Requirements**
- **Greater Versatility**
- **Reduced Maintenance Costs**



Here a Drawer-type Module has been plugged into a Service Shelf which is in the rack in place of the Drawer. Energized Drawer Components are now accessible for servicing.

Motorola's revolutionary new "50 Series" meets the challenge of modern multi-channel microwave communications. Featured in this new system are completely transistorized units—chassis which draw far less power than equipment using vacuum tubes. Transistorization also means negligible heat generation, miniaturization of all units, and—most important of all—greatly increased reliability.

MR-50 MICROWAVE RF EQUIPMENT

New electronic design throughout characterizes Motorola's Model MR-50 Microwave Transmitter and Receiver. Increased power output to one watt in the 6000 mc range provides greater distances per hop than have been hitherto possible. At the same time, an overall transmitter frequency stability is maintained to within ±.005% by means of a newly designed transmitter klystron automatic frequency control (AFC) circuit. Distortion is eliminated by the transmitter AFC circuit which insures klystron operation over the linear portion of the modulation curve.

Reduction of effective fading is an added bonus provided by increased power output and high frequency-stability.

Excellent and long-term performance under a variety of environmental conditions is enhanced by the use of baseband gain regulation, a high degree of negative feedback in modulation amplifiers, stabilized probe-coupled klystrons, and stable, rugged transistors in temperature-compensated circuits.

Advanced Microwave Receiver Design

A harmonic generator excited by a reference oscillator of high inherent stability provides energy at the required local oscillator frequency for the Model MR-50 Microwave Receiver. AFC circuitry is not required in the receiver. Since the transmitter employs AFC circuitry and the receiver is sufficiently stable not to require it, frequency displacement becomes a negligible factor. Further, the receiver is not subject to the possibility of AFC lockout. The latter might otherwise be caused by receiver AFC pulling off-frequency toward a noise source during deep fade caused by atmospheric conditions.

Featured also in the MR-50 Microwave Receiver is improved signal-to-intrinsic-noise performance. In addition, per-hop baseband frequency response is ±.15 db from 1 kc to 1 mc which provides a relatively flat end-to-end system baseband response. Adding to receiver performance is the wider IF bandwidth and 25 db of reserve limiting in IF strips.

Hot Standby, Bilateral Switchover an Option

Solid-state switching plus continuous sensing of all units, both in-service and standby, provide a design of maximum efficiency and reliability for hot standby equipment. Since equipment is transistorized, the extra power drain required by hot standby units is an insignificant factor. Switchover is silent and very fast—no moving parts are involved. Both in-service and standby units are mounted in the same rack —this is possible because of miniaturization. Transmitters and receivers are switched independently of each other, a factor which inherently provides a higher degree of reliability than entire rack switchover.

TRANSISTORIZED MULTIPLEX

As is the case with Model MR-50 Microwave equipment, total transistorization of the associated MC-50 Multiplex equipment provides front access of all units, lower initial installed costs, lower operating costs (including maintenance), and greater system reliability.

240-Channel Motorola Microwave and Multiplex Installation. Rack at left, shown with Baseband Telephone, houses MR-50 Microwave Transmitters and Receivers; MC-50 Racks to the right house Voice Frequency Channel Transmitters and Receivers plus Channel, Group and Supergroup Frequency Generators and Auxiliary Equipment. More channels may be added to system illustrated.

Modular construction is used throughout. Plug-in etched-circuit cards determine the function of the various modules which are in the form of pull-out drawers; each drawer is a "building block" of the expendable MC-50 Multiplex system. Servicing is facilitated by the "service shelf" and the card extender. A service shelf may be plugged into the rack in place of a drawer, and the drawer plugged into the service shelf which then supports it and furnishes electrical connections. The card extender serves in like manner for the etched circuit cards, and allows complete access to both sides of an energized card.

A High Capacity System

MC-50 Multiplex Equipment conforms to both CCITT (Consultative Committee for International Telegraph and Telephone) baseband frequency allocations and to CCITT recommendations. The high channel capacity of MC-50 equipment and its companion MR-50 wide-band microwave radio allows flexibility of expansion without fear of reaching early saturation. Motorola provides a building-block design as well as the "one rack" approach of common equipment and channel units.

Zero Frequency Displacement

Motorola Model MC-50 Multiplex insures zero frequency displacement of each of the many channels which may be installed. All channel, groups, and super-group carriers are generated from a pilot signal which is generated at one station of the microwave system and transmitted throughout the system.

Out-of-Band Signaling

Each voice channel contains sufficient spectrum space for a signaling tone which may be intermittent or continuous, depending upon type of signaling required. All signaling functions including full dial signaling are available. Signaling functions in any channel may be changed by changing plug-in cards.

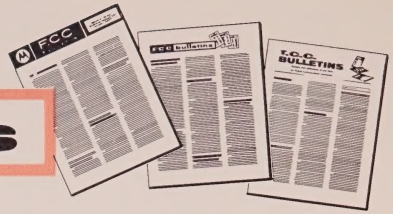
TELEGRAPH CARRIER

Motorola Model MT-50 Telegraph Carrier equipment is designed as companion equipment to Model MR-50 RF and MC-50 Multiplex equipment, and may be operated from the DC voltages available from these models. Model MT-50 Telegraph Carrier equipment features complete transistorization; the equipment may be used over open-wire, cable, or 4-wire voice frequency channels as well as very high frequency (VHF), ultra high frequency (UHF) or microwave radio. Up to 18 channels may be used on a 4-wire circuit, and up to 24 may be placed on a radio baseband. This frequency shift equipment operates by contact keying, current keying, or variable frequency telemetering.

TRANSISTORIZED MICROWAVE ALARM SYSTEM

Motorola Model MA-50 Transistorized Alarm Systems, designed as companion equipment for MR-50 installations, are non-restrictive in use and may be used with other microwave systems as well. Up to eight fault applications are available with one transmitter drawer at each remote station; solid-state switching permits continuous scanning of alarmed points. Central station indication automatically indicates the alarmed remote station, and selective switching shows the alarmed point. Typical fault applications are tower light failure, RF switchover, commercial power failure and unauthorized entry. » » »

FCC bulletins



Accurate Coordinates Required

A major cause for delay in the licensing of new communications systems is the listing of incorrect coordinates in Item 3 of FCC Form 400. Some systems are delayed as much as 60 to 90 days; although an applicant may be able to justify expedited action on his application, he may still face considerable delay because of a problem on coordinates.

When the proposed site has been located on a local map, coordinates of the site in latitude and longitude may be determined by laying a ruler or other equally divided scale at an angle, through the site, with the number of divisions on the scale which are enclosed between two successive lines of longitude being equal, in minutes, to the number of minutes represented by the two successive vertical lines on the map. The same process is repeated with two successive horizontal lines to determine latitude of the site. » » »

Frequency Must Be Specified

Section 1(A) of FCC Form 400 requires that the operating frequency for a proposed station be specified. Many applicants do not complete the frequency section because they have not received the required frequency coordinating committee letter at the time the application is filed.

It is necessary to designate a frequency when Form 400 is filed. Subsequently, if the coordinating committee recommends a different frequency, the required signed and notarized letter of transmittal for the committee letter can also request the Federal Communications Commission to amend the pending application and change the frequency to the one cleared by the Committee. » » »

New Edition of Volume V

Volume V of the FCC Rules and Regulations, which contains Rules Parts 9, 10, 11, and 16, has been revised and must be re-ordered. Renewal subscription price is $2.50, payable to the Government Printing Office, Washington 25, D.C. Subsequent rule amendments, forwarded by transmittal sheets, will then be mailed for an indefinite period until it is calculated that the subscription price has been exhausted. » » »

Expiration of Station Authorization

Upon expiration of a private land mobile radio station license, the FCC mails the licensee a Form 1040, "Notice of Expiration of Radio Station Authorization," which notifies him that his license has expired, that further operation is illegal, and that FCC records on this station will be transferred to the closed files. Prime importance should be placed on the statement: "You are cautioned that operation of unauthorized equipment will be in violation of the Communications Act of 1934 as amended." In substance, the recipient of the Form 1040 is reminded that he no longer has an authorization to operate his radio system.

The Form 1040 also shows what form is to be used by the recipient if he is interested in reinstating his expired authorization. In Parts 10, 11, and 16, an application for reinstatement must be made on a Form 400. This Form 400 must be complete in every detail; "On File — No Change" should not be employed. » » »

Frequency Coordination

In the Special Industrial Radio Service, when an applicant proposes to enlarge or change his mobile area of operation, it is necessary to obtain a new letter of frequency coordination from SIRSA for the new or enlarged area. » » »

A Second Base Station

A radio system which consists of two or more permanently located base stations with their associated mobile units is properly licensed when each of the base stations has a call sign of three letters and three digits plus a mobile-only license with a call sign of two letters and four digits. Should a second permanently located base station be added to an existing base and mobile system licensed under a single three-letter and three-digit call sign, the FCC requires submission of sufficient Form 400 applications that each fixed base station receives its own call sign and the mobile units are separately licensed for their individual mobile-only call sign. In this case, submission of three Form 400 applications are required:

1. A modification of the original license indicating under Item 16(b) reason for modification is to delete the mobiles from the existing license call sign.

2. A Form 400 for the new base station, with Item 16(a) answered indicating "New" station.

3. A Form 400 for the mobile units with Item 16(a) again indicating a "New" station.

The above modifications listed under "1" would be in addition to any other changes which may be necessary at the time of filing. » » »

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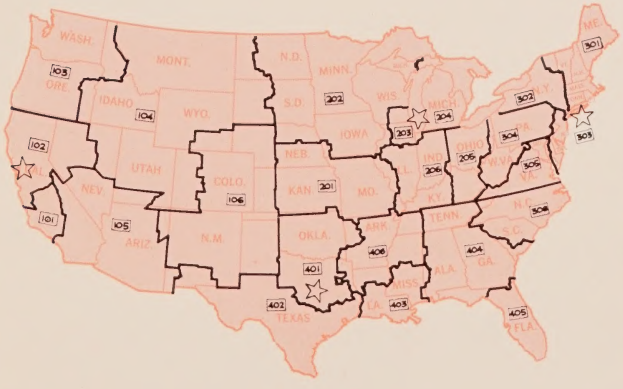

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